

Specification Amendments

Please replace paragraph 003 beginning on page 1 with the following rewritten paragraph:

003 In particular, in forming a dual damascene by a via-first method where the via opening is first formed in one or more dielectric insulating layers followed by forming an overlying and encompassing trench opening for forming a metal interconnect line, several processing steps are required which entail exposing the via opening to dry etching chemistries. As a result, the sidewalls of the via are subject to etching which causes variation in the via opening profile leading to undesirable variations in via electrical resistances and capacitances in the completed metal filled damascene.

Please replace the paragraph 004 beginning on page 2 with the following rewritten paragraph:

004 Approaches to prevent exposing the via opening to etching process have included forming via filling materials within the via opening to protect the via opening from exposure to subsequent processes. For example, prior art processes typically include forming a via filling material within the via

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opening followed by etch back of the via filling material to form a via plug prior to a photolithographic patterning process for forming the trench.

Please replace the paragraph 007 beginning on page 4 with the following rewritten paragraph:

007 One problem affecting DUV photoresist processes is the potential interference of residual nitrogen-containing ~~containing~~ species, for example amines, with the DUV photoresist. Residual nitrogen-containing contamination is one of the greater concerns in the use of metal nitride layers such as silicon oxynitride (e.g., SiON), which is commonly used as a bottom-anti-reflectance coating (BARC), also referred to as a dielectric anti-reflectance coating (DARC). Metal nitride layers, such as silicon oxynitride and silicon nitride are also frequently used as etching stop layers. The DARC layers and etching stop layers are typically exposed in the via plug etchback process leading to potential nitrogen containing species contamination of a subsequently deposited trench line DUV photoresist in a trench line patterning process. For example, it is believed that nitrogen containing species neutralize photogenerated acid catalysts which rendering portions of the photoresist insoluble in the developer. As a result, residual photoresist remains on patterned feature edges,

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sidewalls, or floors of features, detrimentally affecting subsequent anisotropic etching profiles.

Please replace the paragraph 009 beginning on page 5 with the following rewritten paragraph:

009 It is therefore an object of the invention to provide an improved dual damascene manufacturing process to improve via protection while avoiding photoresist poisoning effects including providing a more efficient process to reduce a process cycle time thereby increasing wafer throughput, in addition to overcoming other shortcomings and deficiencies in the prior art.

Please replace the paragraph 0013 beginning on page 6 with the following rewritten paragraph:

0013 Figures 1A-1H are exemplary cross sectional views of a dual damascene structure at stages in manufacturing process ~~including the method~~ according to an embodiment of the present invention.

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Please replace the paragraph 0014 beginning on page 6 with the following rewritten paragraph:

0014 Figure 2 is a process flow diagram including several embodiments of ~~the method of~~ the present invention.

Please replace the paragraph 0019 beginning on page 9 with the following rewritten paragraph:

0019 Still referring to Figure 1A, following deposition of the first IMD layer 14A, a second etching stop layer 12B is formed of a nitride or carbide as explained with respect to etching stop layer 12A, having a thickness of about 300 Angstroms to about 600 Angstroms. Formed over second etching stop layer 12B is a second IMD layer 14B, formed in the same manner and with the preferred materials outlined for IMD layer[[,]] 14A. Typically, the second IMD layer is formed having a thickness about the same or slightly less than the first IMD layer, for example from about 2000 Angstroms to about 5000 Angstroms. It will be appreciated that a single IMD layer may be formed in place of the first IMD layer 12A, second etching stop layer 14B, and second IMD layer 12B.

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Please replace the paragraph 0020 beginning on page 10 with the following rewritten paragraph:

0020 Formed over the second IMD layer 14B is preferably formed a bottom anti-reflectance coating (BARC) layer 16, preferably an inorganic material that also functions as an etch stop layer. For example, silicon oxynitride and silicon oxycarbide are preferably used as a BARC/etch stop layer where the BARC layer also functions as an etch stop or hardmask layer to improve subsequent RIE etching profiles. It will be appreciated that a conventional etch stop layer such as silicon nitride and an overlying BARC layer such as silicon oxynitride may be used in place of a single BARC/etch stop layer 16. For example, the inorganic BARC layer 16 is formed at increments of $\lambda/4$ thickness according to the wavelength (λ) of a subsequent via patterning process to reduce light reflections by index matching. For example, the BARC layer is formed by conventional PECVD or LPCVD processes. Other metal nitrides such as titanium nitride (TiN) may be used as well, but are typically less preferred due to high surface reflectivity. However, an additional organic layer, such as an organic BARC layer[[,]] or a cured negative resist layer, as outlineded below, deposited over the inorganic

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BARC layer, effectively attenuates surface reflectivity ~~is~~
~~effectively attenuated~~ thereby improving the functioning of the
BARC layer 16.